PCT International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : H04Q 7/32

A1

(11) International Publication Number: WO 99/40746

(43) International Publication Date: 12 August 1999 (12.08.99)

(21) International Application Number: PCT/US99/02778

(22) International Filing Date: 9 February 1999 (09.02.99)

(30) Priority Data:
09/021,648 10 February 1998 (10.02.98) US

(71) Applicant: QUALCOMM INCORPORATED [US/US]; 6455 Lusk Boulevard, San Diego, CA 92121 (US).

(72) Inventor: LAROCCA, Peter, J.; 13056 Caminito Del Rocio, Del Mar, CA 92014 (US).

(74) Agents: MILLER, Russell, B. et al.; Qualcomm Incorporated, 6455 Lusk Boulevard, San Diego, CA 92121 (US).

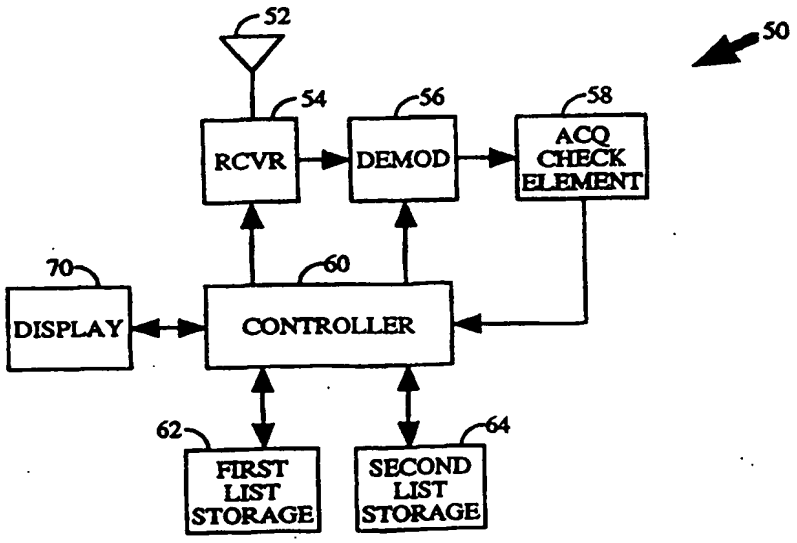
(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published

With international search report.

Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: PHONES WITH MULTIPLE SYSTEM DETERMINATION LISTS



(57) Abstract

A PCS handset with dual system determination lists, labeled as the first list (62) and the second list (64), whereby the handset initially attempts acquisition using the first list (62). After traversing through the first list (62) a predetermined number of time and if acquisition has not been achieved, the handset prompts the user to determine whether there has been a change in location. If the user replies affirmatively the handset then attempts acquisition using the second list (64). Alternatively, if the user reply in the negative, the handset reverts to the first list (62). After successful acquisition, the handset hereinafter utilizes the system determination list which results in successful acquisition. The first list (62) can be a subset or a disjoint set of the second list (64). The content and arrangement of the system determination lists can be selected to optimize acquisition.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PC

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		

PHONES WITH MULTIPLE SYSTEM DETERMINATION LISTS

BACKGROUND OF THE INVENTION

I. Field of the Invention

The present invention relates to communication. More particularly, the present invention relates to a novel and improved personal communication system (PCS) handset or phone with dual system determination lists.

II. Description of the Related Art

The use of code division multiple access (CDMA) modulation techniques is one of several techniques for facilitating communications between a large number of users. Other multiple access communication system techniques, such as time division multiple access (TDMA) and frequency division multiple access (FDMA) are known in the art. However, the spread spectrum modulation techniques of CDMA have significant advantages over other modulation techniques for multiple access communication systems. The use of CDMA techniques in a multiple access communication system is disclosed in U.S. Patent No. 4,901,307, entitled "SPREAD SPECTRUM MULTIPLE ACCESS COMMUNICATION SYSTEM USING SATELLITE OR TERRESTRIAL REPEATERS," and U.S. Patent No. 5,103,459, entitled "SYSTEM AND METHOD FOR GENERATING SIGNAL WAVEFORMS IN A CDMA CELLULAR TELEPHONE SYSTEM," both assigned to the assignee of the present invention and is incorporated by reference herein. Furthermore, the CDMA system can be designed to conform to the "TIA/EIA/IS-95A Mobile Station-Base Station Compatibility Standard for Dual-Mode Wideband Spread Spectrum Cellular System", hereinafter referred to as the IS-95A standard.

The CDMA system can operate at the 900MHz band or the 1800MHz PCS band. Throughout the specification, handset and PCS handset generically refer to a CDMA remote unit or phone operating at any operating frequency.

Typically, CDMA communication is provided to users by system providers. To provide a comprehensive network with broad coverage, the system providers build up the network by adding regions to the coverage area in accordance with user demand and availability of resources. Thus, the network comprises a plurality of geographic coverage areas with each

coverage area serviced by a system. Each system is identified by a unique system identification (SID). A SID can be assigned to cover a large geographic area, such as a city. Alternatively, a SID can be assigned to cover a smaller geographic area, such as the area serviced by one base station controller (BSC). The partition of the network can be decided by the system provider based on numerous requirements, such as the billing and fees structures.

Once a network has been deployed, partitioned, and identified, a system determination list of available systems is provided to each PCS handset. The list comprises the systems with which the handset can communicate. In the prior art, one list is provided for each phone number in a PCS handset. Each handset can be assigned with more than one phone numbers but this is not normally done. Thus, each PCS handset typically operates from one system determination list.

Upon power up, the handset receives the RF signal and attempts to acquires service using a set of parameters assigned to a system selected from the system determination list. If system acquisition is not achieved using this set of parameter, the handset then attempts another system acquisition with the parameters of another system on the list.. The handset systematically traverses through the list until system acquisition is achieved. If the handset reaches the end of the list and system acquisition is still not achieved, the handset can return to the top of the list and restart the acquisition process.

The system determination list can be organized such that the most likely candidates are utilized first. When the user is at "home", e.g. situated within the coverage area which the network believes the user is most likely located, acquisition is efficient since system acquisition is typically achieved with the first or the first few systems on the list. However, acquisition can be extensively prolonged if the user travels to a new area. When this occurs, the handset can attempt acquisition using the parameters of many systems before the correct system is reached. Furthermore, the system determination list increases as the network is built out and more systems are added, further prolonging the acquisition process. Prolonged acquisition process can negatively impact the performance of the system by increasing user frustration and decreasing revenue to the service provider since the time spent trying to acquire to the signal can be more productively spent talking.

SUMMARY OF THE INVENTION

The present invention is a novel and improved PCS handset with a plurality of system determination lists. In the exemplary embodiment, each handset comprises two system determination lists labeled as the first list and the second list. In the exemplary embodiment, the first list contains the systems "local" to the user and the second list contains a comprehensive list of systems capable of communicating with the user. The selection of systems to include in the first list and the second list can be based on numerous factors, including the personal habits of the user, acquisition strategy, and other system requirements.

Initially, the handset attempts acquisition using the first list. After acquisition attempts of each of the systems in the first list fails for a predetermined number of times, the handset prompts the user to determine whether there has been an assumed change in location, e.g. "Is the user on travel?". If the user replies affirmatively, the handset then attempts acquisition using the second list. Alternatively, if the user reply in the negative, the handset remains on the first list. After a successful acquisition, the handset hereinafter utilizes the system determination list which resulted in the successful acquisition.

It is an object of the present invention to provide an improved acquisition process with the use of dual system determination lists. The first list contains the systems with which the user most likely communicates. This list is kept short to minimize the acquisition time. To further improve acquisition, the list can be arranged such that the systems with which the user is most likely to communicate are placed near the top of the list. The second list contains all systems with which the user can communicate. The second list is only used when (1) directed by the user, (2) after a predetermined number of unsuccessful acquisition attempts with the first list, or (3) when the last successful acquisition was with the second list.

It is another object of the present invention to minimize the resources necessary to maintain the dual system determination lists. In the first embodiment, the dual lists are maintain separately to simplify the implementation. In the second embodiment, an additional one-bit field identifier can be added to indicate whether the system is part of the first list. Thus, only one comprehensive list is maintained. The handset scans the comprehensive list and only uses the systems with the appropriate field identifier.

BRIEF DESCRIPTION OF THE DRAWINGS

The features, objects, and advantages of the present invention will become more apparent from the detailed description set forth below when taken in conjunction with the drawings in which like reference characters identify correspondingly throughout and wherein:

FIG. 1 is a diagram of an exemplary CDMA network of the present invention;

FIG. 2 is a block diagram of an exemplary acquisition circuitry within the PCS handset of the present invention; and

FIG. 3 is a diagram of an exemplary first list and second list of the present invention; and

FIG. 4 is a diagram of an exemplary system identifier showing the different fields.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the figures, FIG. 1 illustrates a diagram of an exemplary CDMA network. The network comprises numerous systems 2. Each system 2 can cover a large geographic area, such as a city, or a smaller geographic area. Each system 2 comprises one or more base stations 14 which each base station 14 servicing one or more cells 12. The base stations 14 are controlled by base station controllers (BSC) (not shown in FIG. 1). Handsets 6 are disperse throughout the coverage area and communicate with the CDMA network through base stations 14. Although the present invention is described in the context of a CDMA network, the present invention can be applied generally to other communication networks, such as a TDMA, FDMA, Global System for Mobile Communication (GSM), or GLOBALSTAR network.

In accordance with the present invention, each handset 6 contains a plurality of system determination lists as illustrated in FIG. 3. In the exemplary embodiment, each PCS handset 6 contains two system determination lists. First list 102 contains a list of systems with which handset 6 is likely to communicate. For example, first list 102 can contain the system within which handset 6 is located and adjoining systems. Second

list 104 contains a comprehensive list of systems with which handset 6 can communicate. For example, second list 104 can contain all systems within the network, or a subset of systems in the network, maintained by the service provider with whom the user subscribes, also referred to as the contracted service provider. Additionally, second list 104 can include systems maintained by other service providers which have roaming agreements with the contracted service provider. As described above, first list 102 is a subset of second list 104. In the exemplary embodiment, each element in the system determination lists contains the parameters necessary for proper acquisition, such as the band, frequency, mode, etc.

A block diagram of an exemplary acquisition circuit 50 within handset 6 is shown in FIG. 2. Initially, upon power up, handset 6 attempts acquisition using the parameters of the first system in first list 102 which is stored in first list storage 62. Within handset 6, antenna 52 receives the RF signal and provides the signal to receiver (RCVR) 54. Receiver 54 filters, amplifies, and downconverts the RF signal into a baseband signal. Controller 60 provides the value of the downconversion frequency to receiver 52 in accordance with the parameters associated with the first system in first list 102. The baseband signal is provided to demodulator (DEMOD) 56 which attempts to demodulate the signal with the parameters associated with the first system first list 102. The parameters are provided to demodulator 56 by controller 60. The demodulated signal is provided to acquisition check element 58 which determines whether the received signal was properly acquired. Acquisition check element 58 provides a control signal to controller 60 indicative of status of the received signal, e.g. valid or invalid acquisition. If the first system in first list 102 is the transmitting system, demodulator 56 typically yields a valid output and acquisition check element 58 indicates this fact to controller 60. If the output is invalid, controller 60 selects the next system in first list 102 and uses the parameters for this system to attempt acquisition of the received signal. Again, an invalid output causes controller 60 to select the next system in first list 102. The process continues until all systems in first list 102 have been utilized. In the exemplary embodiment, controller 60 attempts acquisition with first list 102 a predetermined number of times before declaring acquisition failure.

In the exemplary embodiment, handset 6 prompts the user through display 70 when acquisition with first list 102 fails. Handset 6 can display a simple prompt such as "Is the user on travel?". Upon receiving a positive acknowledgment, handset 6 attempts acquisition with second list 104. A negative acknowledgment can result in handset 6 attempting acquisition

with first list 102. In the alternative embodiment, handset 6 can attempt acquisition with second list 104 after acquisition failure with first list 102, without prompting the user.

Acquisition with second list 104, which is stored in second list storage 64, occurs in the same manner as with first list 102. Handset 6 traverses through second list 104 sequentially and attempts acquisition with each system in second list 104. The process continues until handset 6 has traversed through second list 104 a predetermined number of times. At this point, handset 6 can prompt the user again whether the user is on travel. Handset 6 can then utilize first list 102 or second list 104 depending on a negative or positive acknowledgment, respectively.

After successful acquisition to a system either in first list 102 or second list 104, handset 6 can attempt to acquire to a more preferred system. A method for acquisition of a preferred system in the network is described in U.S. Patent Application Serial No. 08/626,744, entitled "METHOD AND APPARATUS FOR PERFORMING PREFERRED SYSTEM SELECTION", filed March 27, 1996, assigned to the assignee of the present invention and incorporated by reference herein. As described in U.S. Patent Application Serial No. 08/626,744, handset 6 determines whether the acquired system is the most desirable system in the geographic area. If this system is not the most desirable, handset 6 can attempt acquisition to the most or more desirable systems in the system determination lists.

In the present invention, handset 6 stores an indication of which system determination list results in successful demodulation. Hereinafter, handset 6 utilizes the last valid system determination list when attempting acquisition or transmission. Handset 6 does not change the system determination list unless directed by the user and/or upon acquisition failure with the current system determination list.

First list 102 and second list 104 can be pre-loaded with the proper systems by the manufacturer or by the service provider. Alternatively, first list 102 and second list 104 can be loaded over-the-air. The use of over-the-air loading provides flexibility in the network design. This allows the lists to be updated with changes in the status of the user or the network. A method and system for performing over-the-air programming, which can be used for loading the system determination lists, are described in detail in U.S. Patent Application Serial No. 08/728,467, entitled "METHOD AND APPARATUS FOR OVER-THE-AIR (OTA) SERVICE PROGRAMMING", filed November

First list 102 can be a subset or a disjoint set of second list 104. In the exemplary embodiment, first list 102 is a subset of second list 104. Thus, second list 104 contains all systems contained in first list 102. Making second list 104 a superset of all available systems allows handset 6 to acquire to any system in the network. This can be helpful when the source of the signal is not known.

In the alternative embodiment, the two system determination lists can be disjoint wherein no systems appear in both lists. Using disjoint sets, there is no overlap between first list 102 and second list 104, which can result in faster acquisition.

In the exemplary embodiment, first list 102 and second list 104 are implemented as two separate lists. Each list can be implemented as a circular buffer. Each buffer maintains a pointer which points to the system with which handset 6 is attempting communication or is currently in communication. The pointer moves to the next system if acquisition with the current system fails. Alternatively, first list 102 and second list 104 can be implemented as stacks. Each stack places the system with which communication has been most recently established at the top of the stack. When communication is established with a system not on top of the stack, that system is relocated to the top of the stack. The acquisition process starts from the top of the stack and traverses to the bottom. Other implementations of first list 102 and second list 104 can be contemplated and are within the scope of the present invention.

In an alternative embodiment, first list 102 and second list 104 are implemented with one comprehensive list. For each system, LIST NUM field 128 (see FIG. 4) is added which indicates whether that system belongs in first list 102 or second list 104. When attempting to acquire using first list 102, handset 6 scrolls through the comprehensive list and only utilizes systems which are part of first list 102, as indicated by LIST NUM field 128. When using second list 104, handset 6 can ignore LIST NUM field 128 and utilize all systems, if first list 102 is a subset of second list 104. If first list 102 and second list 104 are disjoint sets, handset 6 ignores the system if LIST NUM field 128 indicates that the system is in first list 102. LIST NUM field 128 costs one-bit to implement. However, first list 102 can be eliminated with this embodiment so the additional cost may be justified.

Within handset 6, first list 102 and second list 104 can be stored in a storage element or one of any number of memory devices that are known in the art, such as RAM memory devices, latches, or other types of memory

devices. The systems within first list 102 and second list 104 can be accessed as necessary by handset 6.

The assignment of systems to first list 102 and second list 104 can be determined based on numerous factors, including the personal habits of the user, acquisition strategy, and other system requirements. The system determination lists of each handset 6 can be custom designed to match the personal habits of the users. For example, first list 102 can contain systems to which the user travels to frequently or systems with which the user subscribes. Furthermore, first list 102 of a "stationary" user, e.g. user which have high tendency to remain within or near the home system, can be trimmed down accordingly to improve the acquisition process. Thus, the size of first list 102 and the systems included in first list 102 can be tailored to optimize the acquisition process for each user.

Within each system determination list, the systems can be arranged to improve the acquisition process. To improve the probability of success, first list 102 and second list 104 can be arranged with the systems with which handset 6 is most likely to communicate placed near the top of the list. For example, each list can be arranged with the systems closest to the "home" system, e.g. closest according to distance, placed near the top of the list. Alternatively, each list can be arranged according to the frequency of calls made to the systems. Other methods of arranging the systems within the system determination lists can be contemplated and are within the scope of the present invention.

Although the present invention has been described in the context of dual system determination lists, the inventive concept can be further extended to any number of system determination lists. For example, one list can contain systems local to the user, e.g. the campus network associated with work or school. A second list can contain the systems in the city in which the user resides. A third list can contain all systems maintained by the service provider with whom the user has contracted for service, or the contracted service provider. An additional list can contain systems of other service providers which have roaming agreements with the contracted service provider. Acquisition can be first performed with the parameters of the systems in the list most likely to result in successful acquisition and last with the least likely list. Other lists can be created and maintained and are within the scope of the present invention.

A diagram of an exemplary element of the system determination lists is illustrated in FIG. 4. Each element contains a plurality of fields. Some of

Programming of Mobile Stations in Wideband Spread Spectrum Systems" which is incorporated by reference herein. The fields are further described in detail in U.S. Patent Application Serial No. 08/509,719, entitled "METHOD FOR SYSTEM DETERMINATION IN A MULTI-MODE SUBSCRIBER STATION", filed July 31, 1995, assigned to the assignee of the present invention, and incorporated by reference herein. In the exemplary embodiment, system identification (SID) field **122** contains the identifier of the system. Similarly, network identification (NID) field **124** contains the identifier of the network. Mode field **126** specifies whether the network is a CDMA or other network type, e.g. analog. Depending on the system design and the implementation of the system determination lists, additional fields may be desirable or necessary. For example, LIST NUM field **128** can be a one-bit field indicating whether the system is part of first list **102** or second list **104**. This field is necessary if first list **102** and second list **104** are implemented with one comprehensive list as described above. NUM ATTEMPT field **130** contains the number of attempts at acquisition to this system before acquisition failure is declared. Each system can be associated with a different number of attempts, depending on the probability that the current communication is with this system. The number of attempts can be based on past statistics or the distance of that system to the home system. Thus, the acquisition process can dwell on some systems longer than others, again to improve the acquisition process. Additional fields to improve the acquisition process can be contemplated and are within the scope of the present invention. For example, a field indicating the number of times successful acquisition has been previously achieved for a system can be included.

Each element can also contain other fields, such as the carrier frequency, which are necessary to implement other system functionalities. These fields can be included in the definition of element **120**. Alternatively, these fields can be contained in another memory element which can be accessed as necessary by handset **6**.

The previous description of the preferred embodiments is provided to enable any person skilled in the art to make or use the present invention. The various modifications to these embodiments will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other embodiments without the use of the inventive faculty.

Thus, the present invention is not intended to be limited to the embodiments shown herein but is to be accorded the widest scope consistent with the principles and novel features disclosed herein.

I CLAIM:

CLAIMS

1. A method for establishing communication with a communication network comprising the steps of :

attempting to establish communication with systems in a first list; and

attempting to establish communication with systems in a second list if said attempting to establish communication with systems in said first list step results in an acquisition failure.

2. The method of claim 1 further comprising the step of :

repeating said steps of attempting to establish communication with systems in said first list and attempting to establish communication with systems in said second list a predetermined number of times if said attempting steps result in acquisition failure.

3. The method of claim 2 further comprising the step of :

prompting a user if there has been an assumed change in location of said user, said prompting step occurring before said step of attempting to establish communication with systems in said second list.

4. The method of claim 3 further comprising the step of :

retaining a valid system determination list which results in successful establishment of communication, said valid system determination list being said first list or said second list.

5. The method of claims 4 wherein subsequent attempts at establishing communication comprises the step of :

attempting to establish communication with systems in said valid system determination list.

6. The method of claim 1 wherein said first list is a subset of said second list.

7. The method of claim 1 wherein said first list is generated based on a user habit.

8. The method of claim 1 wherein said first list and said second list are arranged to optimize establishment of communication with said communication network.

9. The method of claim 1 wherein said first list and said second list are represented by one comprehensive list.

10. A handset for establishing communication with a communication network comprising :

storage means for storing a first set of systems; and

storage means for storing a second set of systems;

wherein said handset attempts to establish communication with systems in said first list and said second list, said handset using said second list if attempts to establish communication with systems in said first list results in an acquisition failure.

11. The handset of claim 10 wherein said handset repeats attempts to establish communication with systems in said first list and said second list a predetermined number of times while acquisition failure persists.

12. The handset of claim 11 further comprising :

display means for displaying a prompt, said handset displaying said prompt if attempts to establish communication with systems in said first list or said second list results in said acquisition failure.

13. The handset of claim 12 wherein said handset retains an indication of whether said first list or said second list results in successful establishment of communication.

14. The handset of claims 13 wherein said handset utilizes said indication in subsequent attempts at establishing communication.

15. The handset of claim 14 wherein said first list is a subset of said second list.

16. The handset of claim 14 wherein said first list is generated based on a user habit.

17. The handset of claim 14 wherein said first list and said second list are arranged to optimize establishment of communication with said communication network.

18. The handset of claim 14 wherein said first list and said second list are represented by one comprehensive list.

19. The handset of claim 14 wherein said first list and said second list are implemented as stacks or circular buffers.

20. The handset of claim 14 wherein each system within said first list and said second list comprises a field indicative of the number of attempts at establishing communication with said system before declaring acquisition failure.

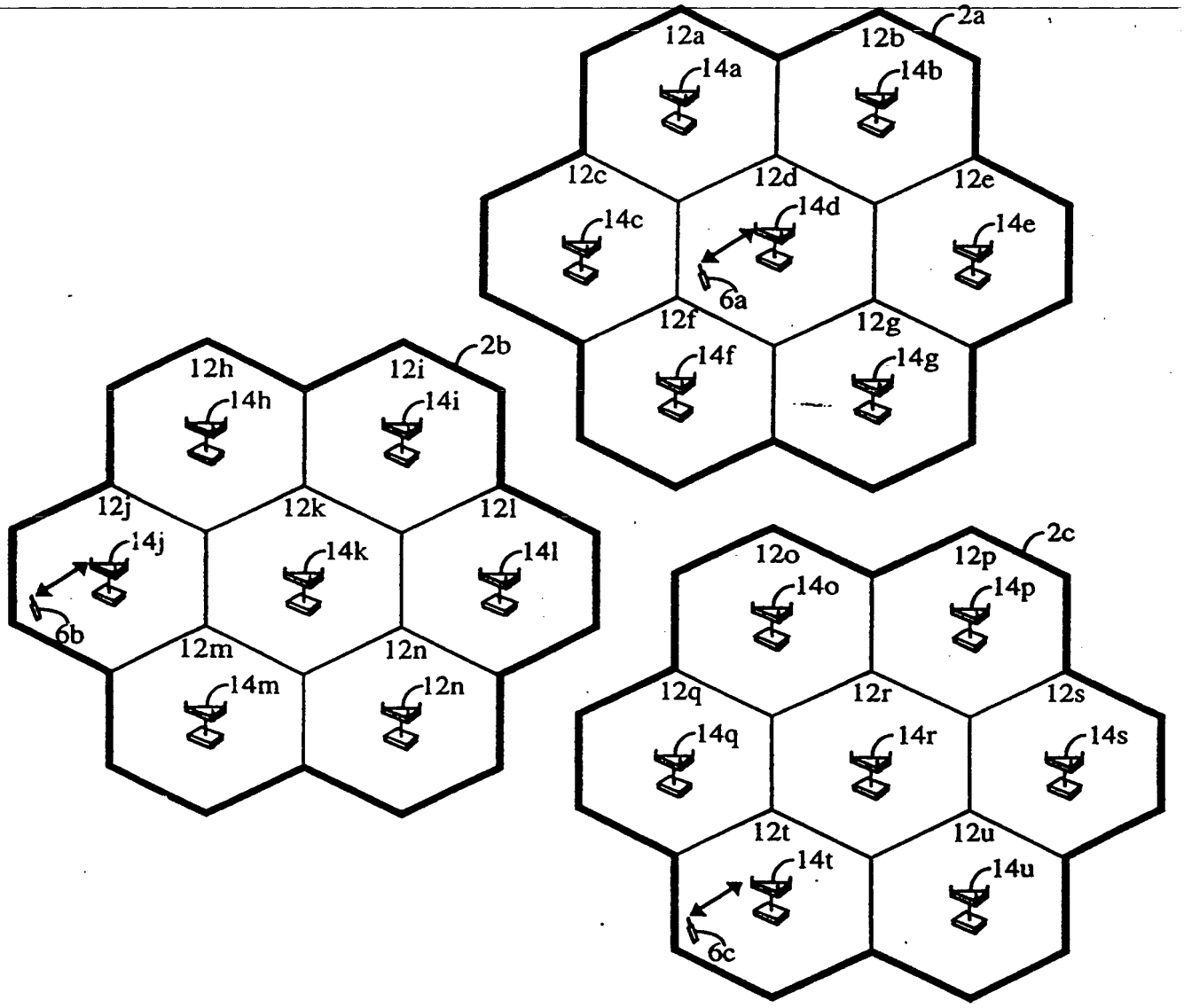

2a
12a
12b
14a
14b
12c
12d
12e
14c
14d
14e
6a
12f
12g
14f
14g
2b
12h
12i
14h
14i
12j
12k
12l
14j
14k
14l
6b
12m
12n
14m
12n
2c
12o
12p
14o
14p
12q
12r
12s
14q
14r
14s
12t
12u
14t
14u
6c

FIG. 1

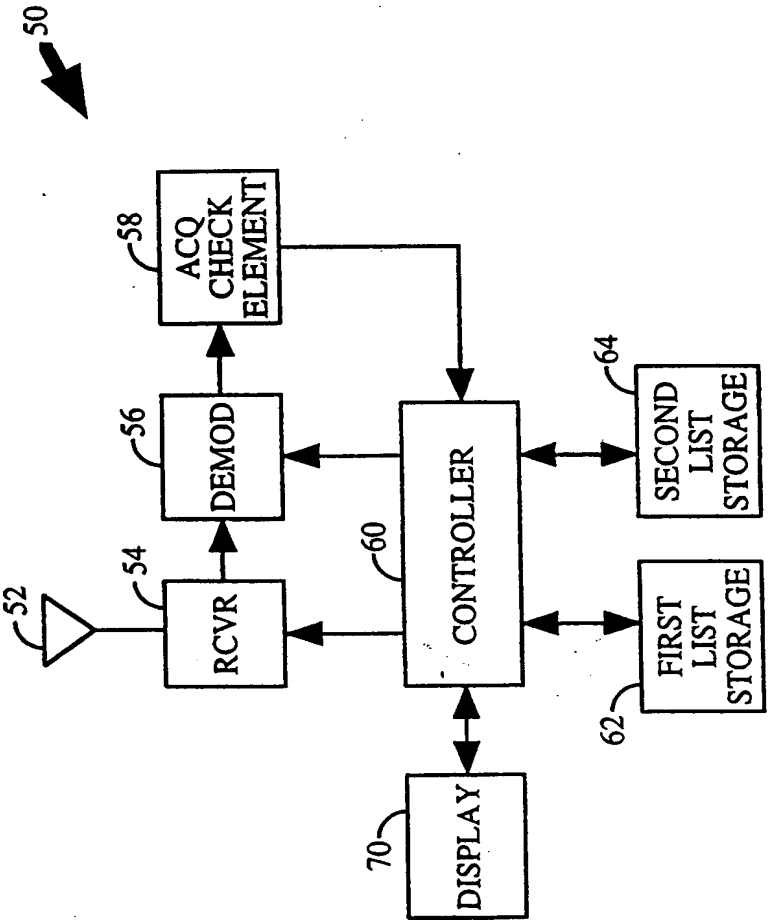

50
58
ACQ CHECK ELEMENT
56
DEMOD
54
RCVR
52
60
CONTROLLER
64
SECOND LIST STORAGE
FIRST LIST STORAGE
62
70
DISPLAY

FIG. 2

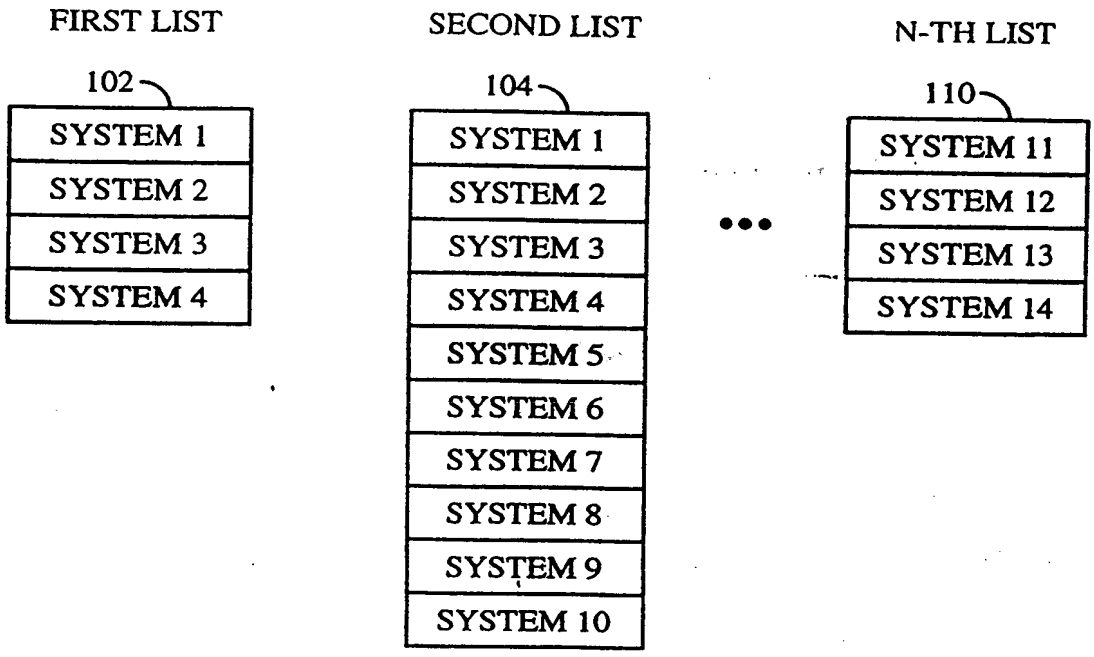

FIRST LIST
102
SYSTEM 1
SYSTEM 2
SYSTEM 3
SYSTEM 4
SECOND LIST
104
SYSTEM 1
SYSTEM 2
SYSTEM 3
SYSTEM 4
SYSTEM 5
SYSTEM 6
SYSTEM 7
SYSTEM 8
SYSTEM 9
SYSTEM 10
N-TH LIST
110
SYSTEM 11
SYSTEM 12
SYSTEM 13
SYSTEM 14

FIG. 3

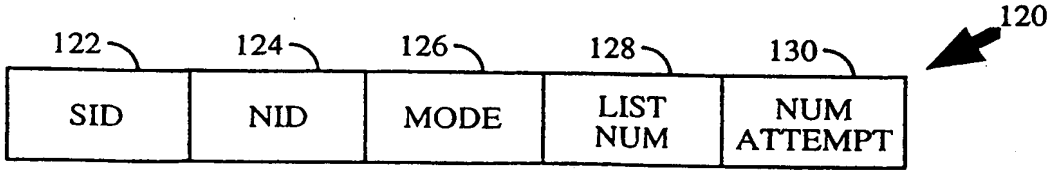

120
122
124
126
128
130
SID
NID
MODE
LIST NUM
NUM ATTEMPT

FIG. 4

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04Q7/32

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 97 36452 A (QUALCOMM INC) 2 October 1997 cited in the application see page 3, line 35 - page 4, line 7 see page 8, line 11 - line 17 see page 9, line 25 - line 36 see figure 1	1,2,6-11
A	EP 0 781 064 A (NOKIA MOBILE PHONES LTD) 25 June 1997 see column 3, line 52 - column 5, line 20	1,10
A	EP 0 603 049 A (ALCATEL RADIOTELEPHONE) 22 June 1994 see column 2, line 46 - column 3, line 17	1,10

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 May 1999	07/06/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Dionisi, M

1

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter ional Application No
PCT/US 99/02778

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9736452 A	02-10-1997	US 5870674 A	09-02-1999
		AU 2673297 A	17-10-1997
		CA 2250049 A	02-10-1997
		EP 0890288 A	13-01-1999
EP 0781064 A	25-06-1997	NONE	
EP 0603049 A	22-06-1994	FR 2699357 A	17-06-1994
		AT 171583 T	15-10-1998
		DE 69321205 D	29-10-1998
		DE 69321205 T	04-03-1999
		ES 2124775 T	16-02-1999
		FI 935594 A	17-06-1994
		NO 934619 A	17-06-1994
		NZ 250310 A	26-07-1996
		US 5809416 A	15-09-1998